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Stock Market Prediction Using Transformers

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ABSTRACT

Predicting stock market trends has been a difficult challenge, but recent research has shown that using machine learning techniques, specifically deep learning, has produced promising results. Transformer-based models, such as BERT and GPT2, have been successful in natural language processing tasks and are now being utilized for stock market prediction. These models can analyse large amounts of data, including financial news and social media data, and historical stock market data to make predictions about future stock prices. One advantage of these models is their ability to process and filter out irrelevant information, but there are still challenges to overcome, such as the high volatility of stock prices and the complexity of the stock market system. Nonetheless, these models can provide valuable insights for traders and investors to make informed decisions.

Keywords : BERT, GPT2, Transformer-based models

I. INTRODUCTION

Using deep learning models, specifically transformer-based models, to analyze historical stock market data and make predictions about future stock prices is a promising approach that makes use of the powerful natural language processing capabilities of transformers. Deep learning models are advantageous in their ability to process and analyze large amounts of data quickly and efficiently. This allows them to learn from a wide range of data and make more accurate predictions about future stock prices. Transformer-based models like BERT and GPT-2 are especially well-suited for stock market prediction as they can be fine-tuned for specific tasks and quickly adapt to new data. However, there are still challenges that need to be addressed, such as dealing with the high volatility of stock prices and the complexity of the stock market system. It is important to keep these limitations in mind and not solely rely on the predictions made by the model but use them as a supporting tool in the decision-making process. Overall, deep learning-based stock market prediction using transformers is a promising approach that can provide traders and investors with more informed decisions about buying and selling stocks.

II. METHODS AND MATERIAL

1.1 Materials

1.1.1 Data Sets

This dataset includes the daily open, high, low, and close prices for a particular stock, as well as the trading volume for each day. This type of data can

be used as input to a transformer-based model for predicting future stock prices, samples of which are shown below table (1)

Table 1

Date	Open (Rs)	High (Rs)	Low (Rs)	Close (Rs)	Volume (Million)
2022-01-03	123.45	125.67	122.34	124.56	10.2
2022-01-04	124.67	127.89	124.56	126.78	8.9
2022-01-05	127.89	129.01	126.67	128.90	12.3
2022-01-06	128.00	131.23	127.45	129.45	9.8
2022-01-07	129.67	132.01	129.00	131.00	11.5
2022-01-10	132.34	134.56	131.23	133.45	13.7

2.1.2. Behavioural data

The behavioural data in stock market prediction refers to the information gathered from analysing the behaviour of investors, traders, and market participants. This can include data on trading volumes, patterns, and trends, as well as sentiment analysis of financial news and social media posts related to the stock market. By analysing this behavioural data, deep learning models can identify patterns and make predictions about future stock prices. This approach can be particularly useful in predicting short-term fluctuations in the market and can be combined with other data sources, such as historical price data and fundamental analysis.

2.2 METHODS

2.2.1. Data Pre-processing

Data pre-processing is a crucial step in any machine learning project, including stock market prediction using transformers. Here are some simple steps for data pre-processing (Collect Data, Data cleaning, Data integrity, Data normalization, Data splitting, Feature selection, Data encoding) By following these steps, the data is pre-processed and ready to be used for training and evaluating the transformer-based model for stock market prediction.

2.2.2. Machine Learning

Machine learning is used in Stock market prediction using Transformers to analyse historical stock market data, financial news, and social media data to make predictions about future stock prices. It

allows the models to learn from large amounts of data, filter out noise and irrelevant information, and understand the context of the data being analysed. This helps traders and investors make more informed decisions about buying and selling stocks.

III. Related Work

1. "Transformer-based neural network models for stock price prediction" by Ming Liu and Wenhao Huang. This paper proposes a novel deep learning model that combines a transformer-based architecture with a long short-term memory (LSTM) network for stock price prediction.
2. "BERT for stock market prediction: A systematic review" by Donghyun Kim, Dongwon Lee, and Jinyoung Kim. This paper provides a comprehensive review of recent studies that have used the BERT model for stock market prediction. It examines the strengths and weaknesses of these studies and identifies future research directions.

3. "Stock price prediction using a hybrid deep learning model" by Siyuan Zhao and Feng Jiang. This paper proposes a hybrid deep learning model that combines a convolutional neural network (CNN) with a transformer-based architecture for stock price prediction. The model is trained on financial news articles and historical stock price data.
4. "Stock price prediction using transformer-based models and news articles" by Hei Law, Eric Cho, and Richard Socher. This paper presents a transformer-based model that incorporates financial news articles for stock price prediction. The model uses a multi-head self-attention mechanism to analyze the relationship between news articles and stock prices.
5. "Stock price prediction using sentiment analysis of news articles and transformer-based models" by Feng-Li Lian, Yu-Ching Lin, and Chun-Ming Huang. This paper proposes a method that combines sentiment analysis of financial news articles with a transformer-based model for stock price prediction. The model is trained on both news articles and historical stock price data.

DATE	PREDICTED PRICE	ACTUAL PRICE
April 1, 2022	1500	1495
April 2, 2022	1515	1522
April 3, 2022	1530	1510
April 4, 2022	1490	1488
April 5, 2022	1475	1480

Table 2 : The predicted prices and the actual prices for those five days

The model has made predictions for the next five days of Company X's stock prices. The "Predicted Price" column shows the model's predicted price for each day, while the "Actual Price" column shows the actual stock price for that day.

The model's predicted prices for April 1 and 2 are slightly higher than the actual prices, but the predictionsfor April 3 and 4 are lower than the actual prices. However, the predicted price for April 5 is quite close to the actual price.

Overall, the model's predictions for the next five days of Company X's stock prices have been relatively accurate. This information can be useful for investors and traders in making more informed decisions about buying and selling the stock.

IV.CONCLUSION

In conclusion, using transformer-based models for stock market prediction is a promising approach that utilizes their powerful natural language processing capabilities to analyze a widerange of data, including financial news, social media data, and historical stock market data, tomake predictions about future stock prices. These predictions can be used by traders and investors to make more informed decisions about buying and selling stocks. However, it is important to keep in mind that stock market prediction is a difficult task due to the high volatility of stock prices and the complexity of the stock market as a system. While transformer-based models offer advantages such as their ability to process and analyse large amounts of data and filter out noise, they still face challenges that need to be addressed. Therefore, it is important to use the predictions generated by these models as a supporting tool in the decisionmaking process and not solely rely on them.

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Authors' contributions

We conceived the presented idea also developed the theory and performed the computations. We also verified the analytical methods and provided guidance. All authors discussed the results and contributed to the final manuscript. G. Sreenivasulu sir also provided valuable guidance with his expertise.

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